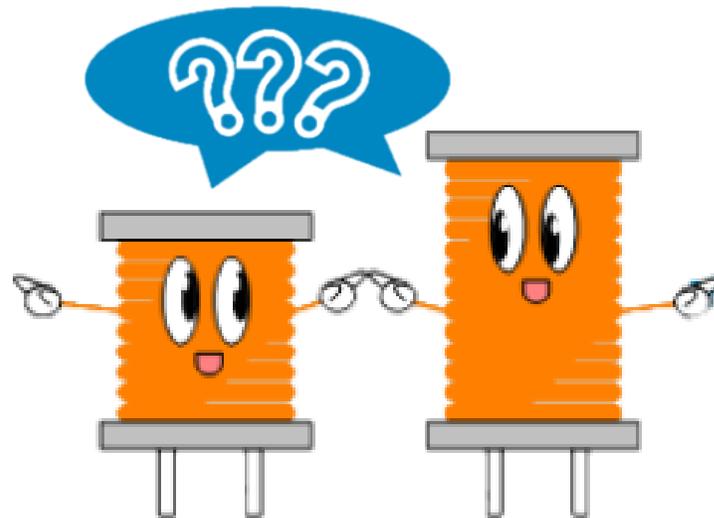


# Dear Rookie of the Coil

## Chapter 1 What's the Coil ?

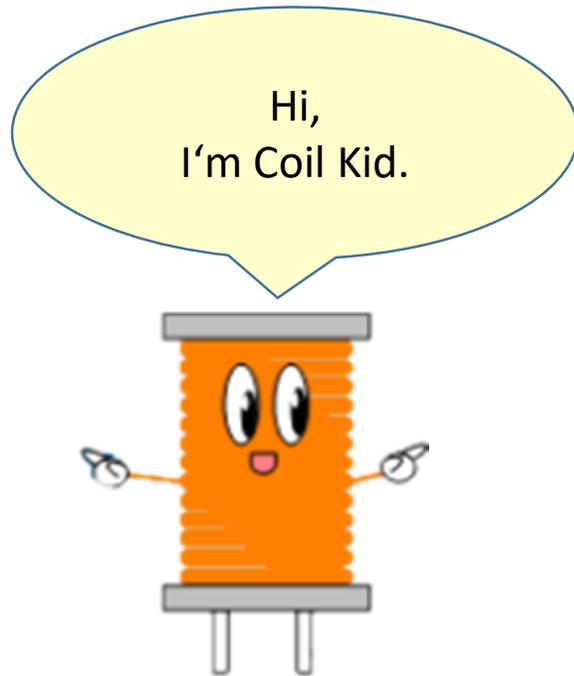


SAGAMI ELEC CO., LTD.

# Welcome to the Coil World!

Nice to see you!! We are SAGAMI ELEC. CO., LTD.

We specialize in “Coils” which are used for lots of electric devices.

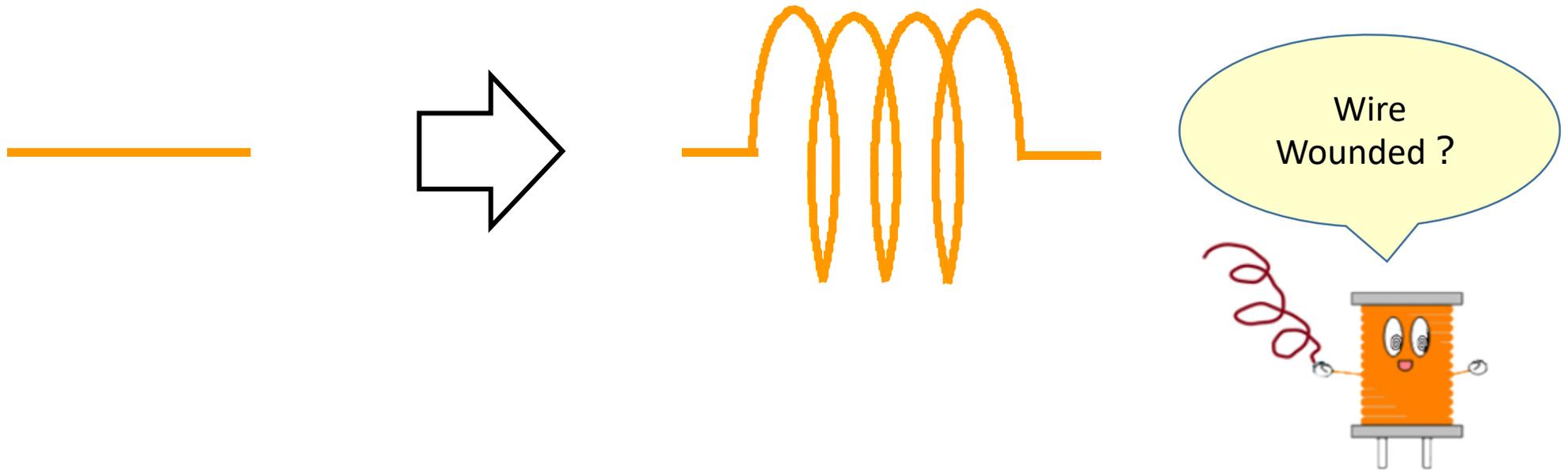


For those who are not familiar with Coils,  
We would like to explain it very simply  
and very easily.

So are you ready??

# What is Coils?

In simple words, Coils are “Wire Wounded things.”  
General meaning, springs are also categorized as Coil.



# Principles of Coils

We understand it is so hard for Rookies to imagine Coils even though we explained that Coils are “Wire Wounded things” last page.

Here, We are trying to explain about what a Coil is base on the simple experiment.

A Ring made of Enameled Wire is a coil.

When an electric current is flowed through a coil, Magnetic field is generated.

We made a movie that when Magnetic field is generated Iron-sand is moving.

Please watch! ⇒

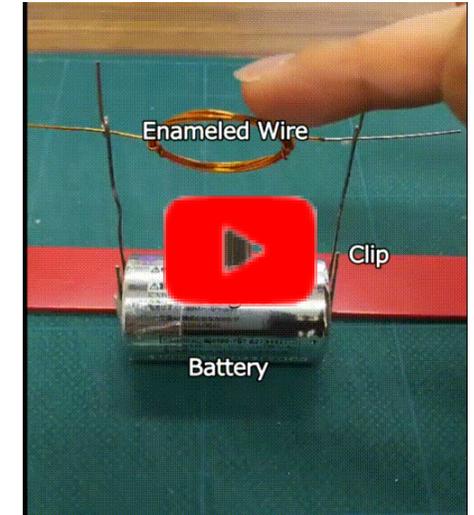


# Principles of Coils

How to assemble a Clip Motor.

Battery, Magnet, Clip and Enameled Wire are materials in this clip Motor.

Please watch! ⇒

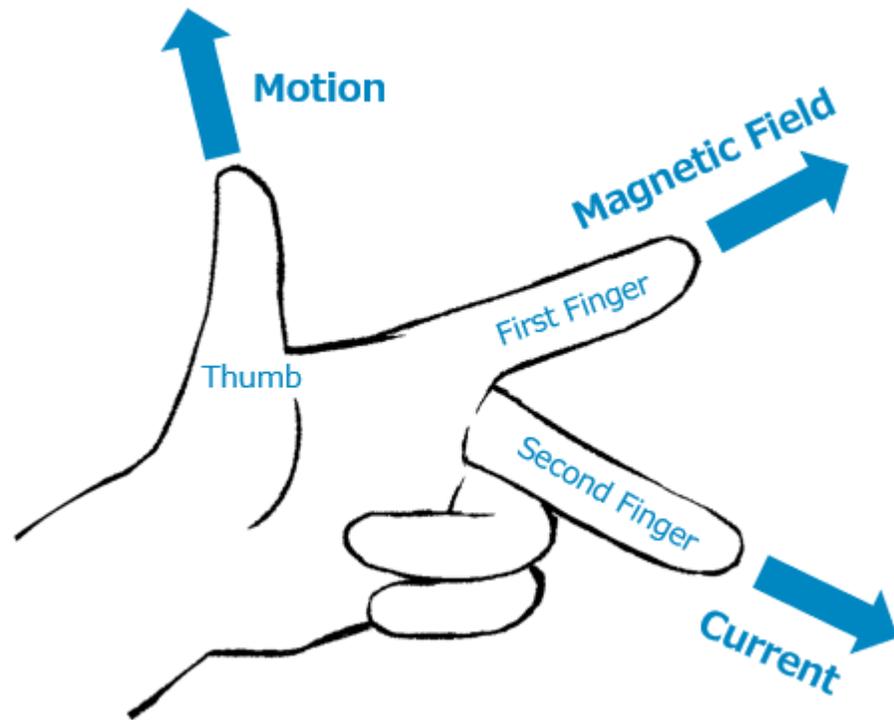


It is a mechanism that when the Magnetic Fields generated from the coil and the one from the Magnet repel each other, a coil would spin around naturally as shown in a movie.

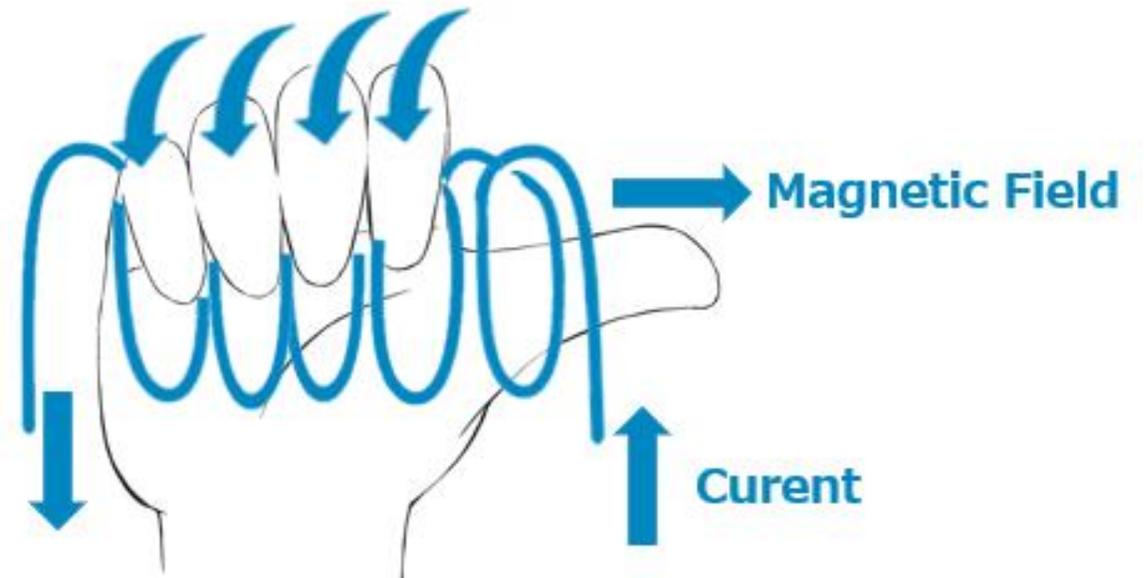
This Motor is taking advantage of the nature of repelling between Magnetic Fields and Magnet generated from the Coil.

# Principles of Coils

Do “Fleming’s Left-Hand Rule” or “Right-Hand Rule” ring a bell with you?



Fleming's Left-Hand Rule

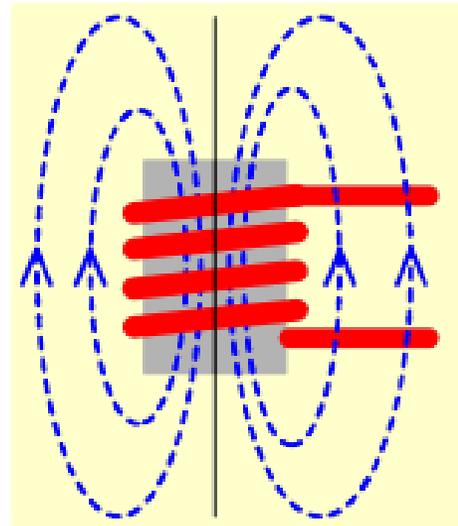
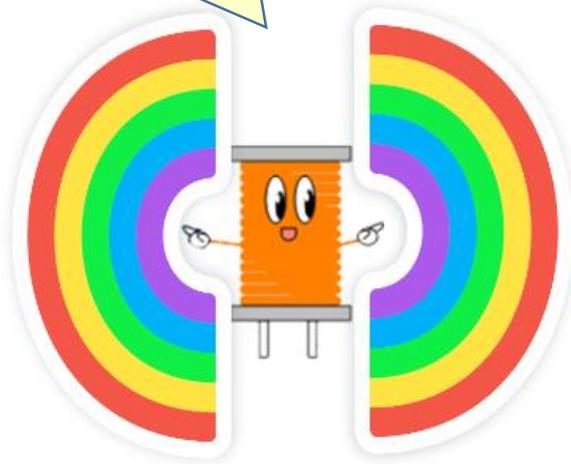


Right-Hand Rule

# Principles of Coils

We will talk about a coil as an Electronic Components from now on.

Magnetic Field is generated when an electronic current flows through me.

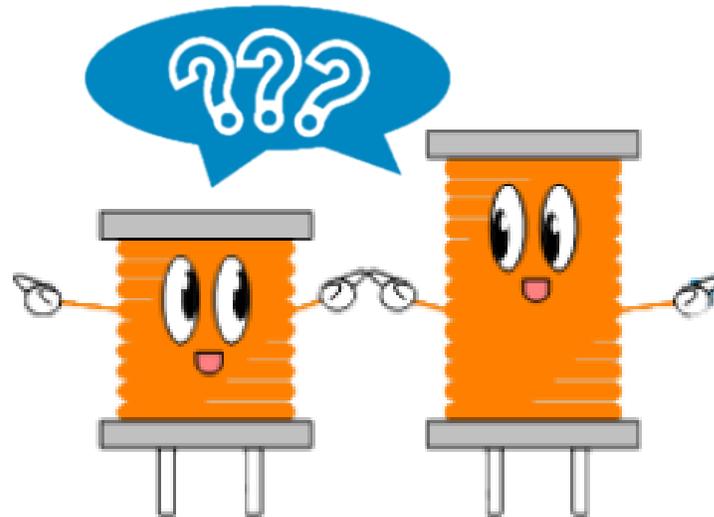


To be continued...



# Dear Rookie of the Coil

## Chapter 2 Coil's Functions 【Noise Removal】



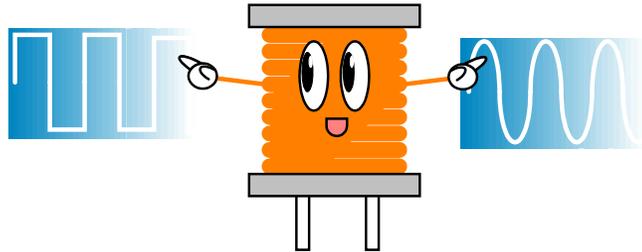
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# Coil's Functions "Noise Removal"

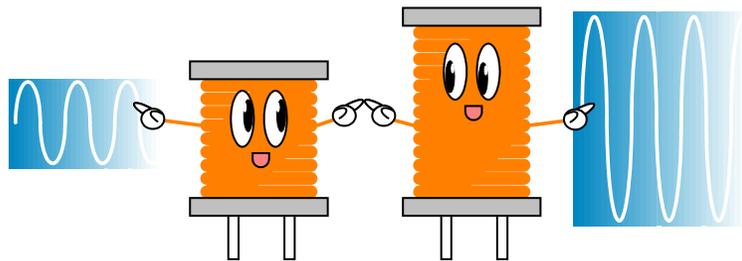
In general, The Coil has mainly 4 Functions.

We will explain about one of functions "Noise Removal" in this time.

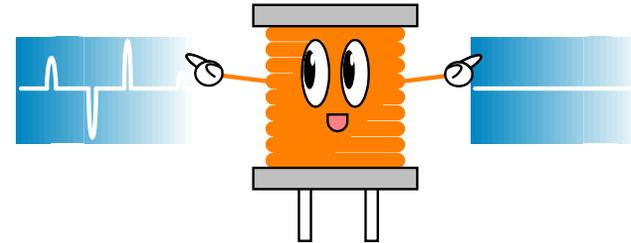
Noise Removal



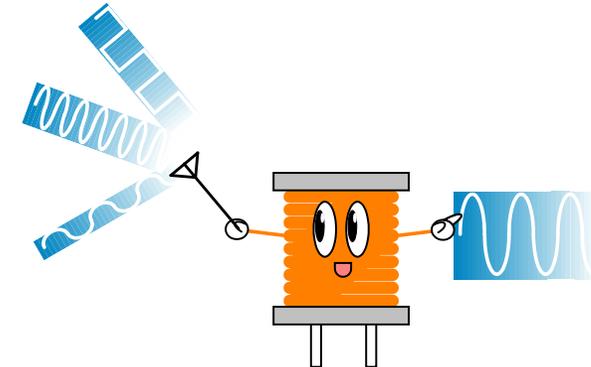
Voltage Conversion



Filtering

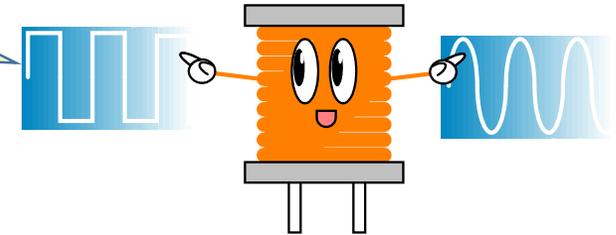


Radio Wave  
Transmission and Reception



# Coil's Functions "Noise Removal"

I'll remove the Noise,  
every time.



## What is the **Noise** ?

**Negative factors that prevent the desired signal(information) to be transmitted accurately.**

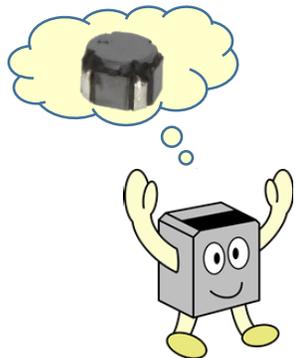
There are 2 Signals "Information" for electricity.

The Signal that you is necessary, or that is unnecessary and harmful.

We called latter meaning "the Noise" in this case.

Ex) One of harsh-sounding on a radio program.

Fuzzy reception on a TV.



# Coil's Functions "Noise Removal"

**The Noise** affects the other parts.  
And unfortunately it causes some trouble...

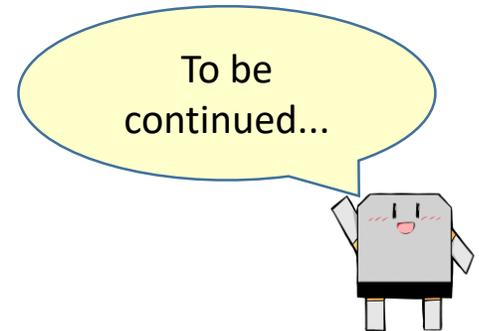
Ex) LED Headlights for Automotive

When you turn on the headlights, the noise is happening, and then it affects on the radio reception.



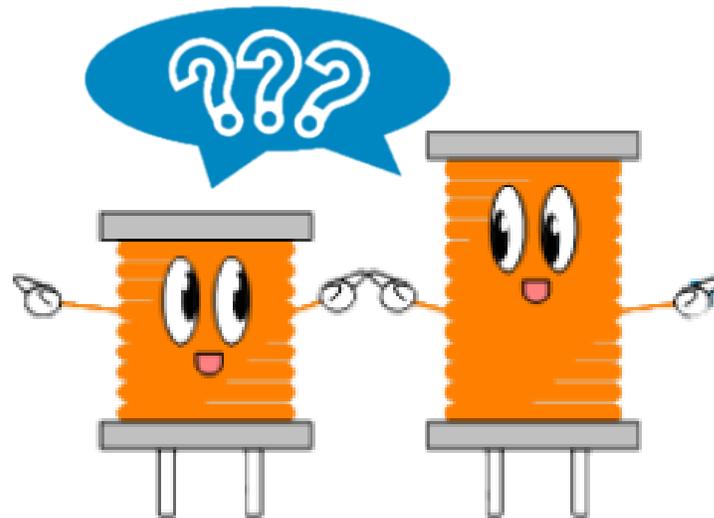
The Coil prevents the noise from affecting the radio reception.

**This is one of advantage by Coil's Functions.**



# Dear Rookie of the Coil

## Chapter 3 Coil's Functions 【Voltage Conversion】



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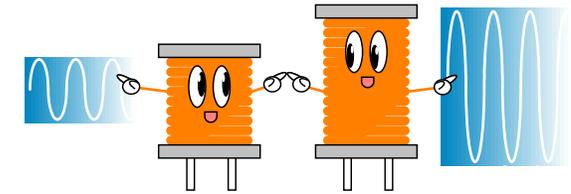
# Coil's Functions "Voltage Conversion"

We will explain about one of functions "Voltage Conversion" in this time.

What is the **Voltage Conversion** ?

We can increase or decrease the Voltage.

In the Electric technology, is used "Watt" as an indicator of the electric power.

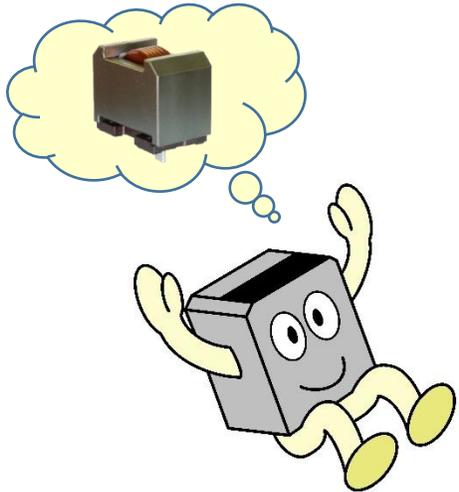


We can see "Watt" on electrical appliances, such as 30W, or 30VA.

# Coil's Functions "Voltage Conversion"

Electric power is calculated by multiplying Voltage(V) × Current(A).  
For example, 100W, there is plenty of combinations to figure out 100W.

Here are some examples.



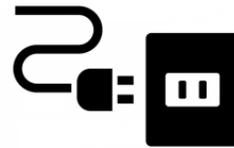
① 10A(ampere)	X	10V(volt)	=	100W
② 2A	X	50V	=	100W
③ 25A	X	4V	=	100W

# Coil's Functions "Voltage Conversion"

Why do we have to change voltage and current ?

Now we explain it with one example "Electrical Outlet."

In Japan, "100V" is used at the general household.

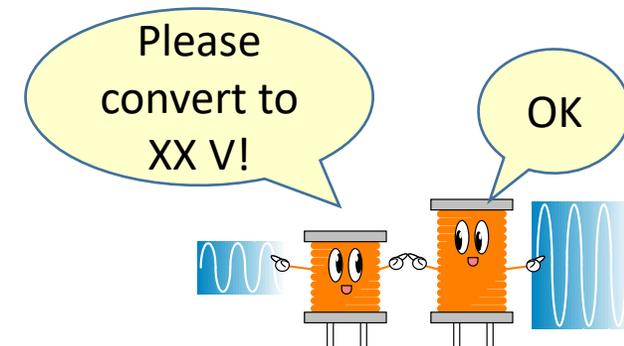


We can use electrical appliances after plugging in. However they have their own voltages in order to actuate.

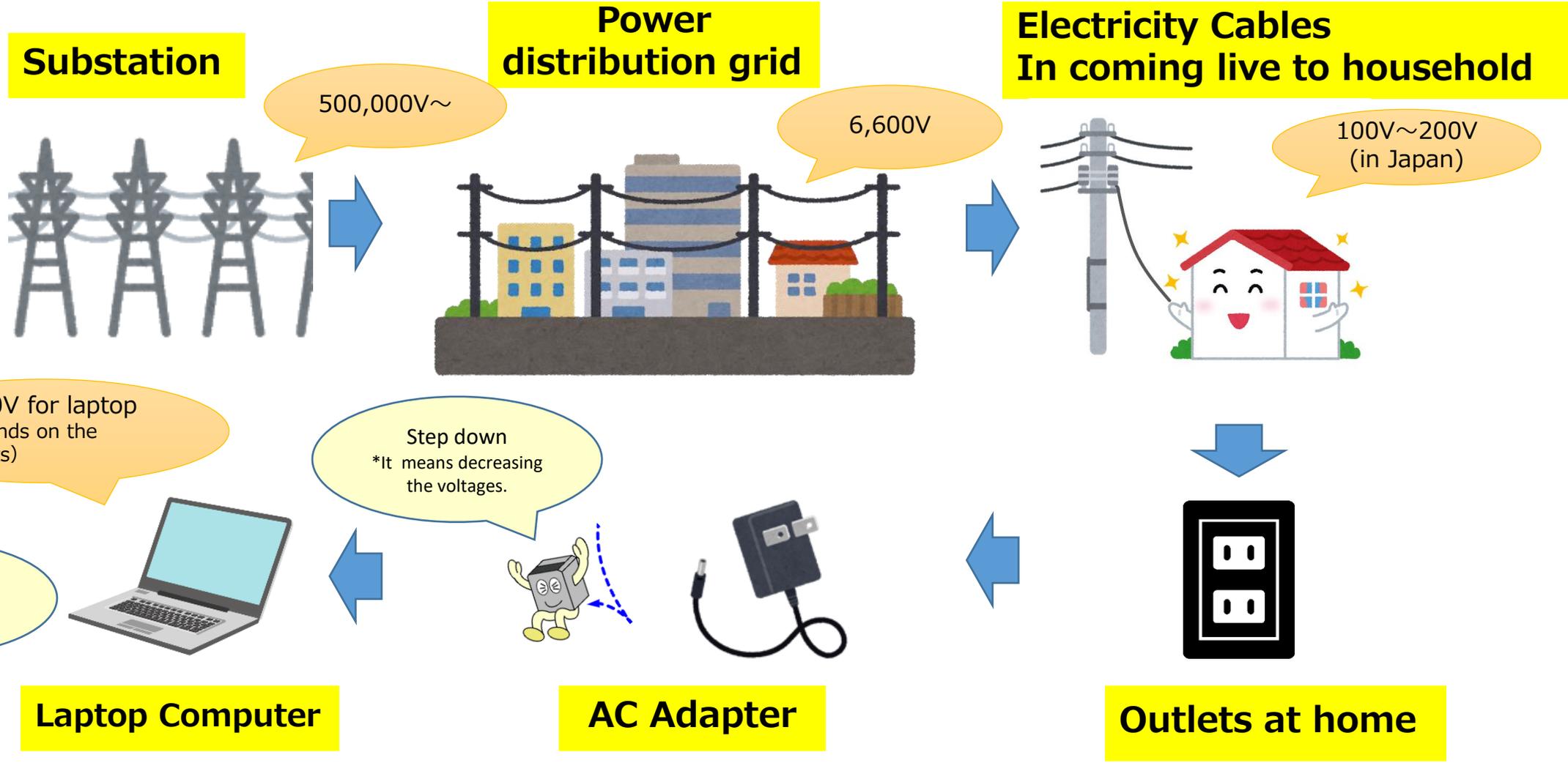
Some has several voltages, others several hundred voltages.

So we need to convert the voltage for each appliances from 100V.

Coil is used for this Voltage Conversion.

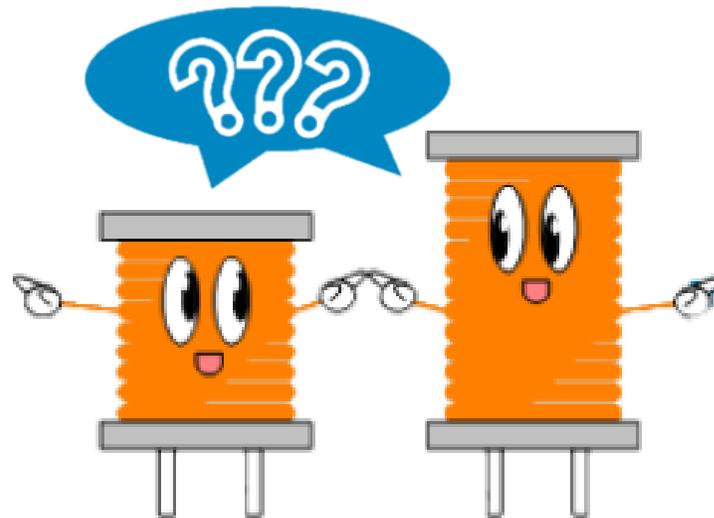


# Coil's Functions "Voltage Conversion"



# Dear Rookie of the Coil

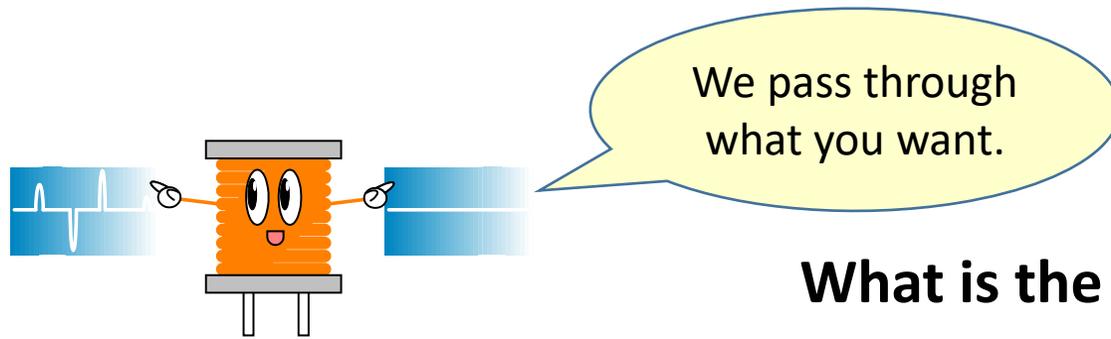
## Chapter 4 Coil's Functions 【 Filtering 】



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# Coil's Functions "Filtering"

We will explain about one of functions "Filtering" in this time.



You can image the filtering generally...

What is the **Filtering** ?

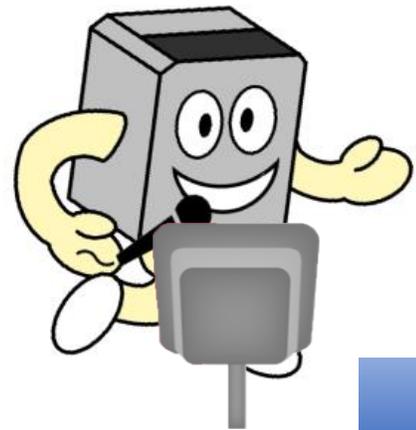
It extracts the what you need,  
and discard unnecessary one.



- Ex) Coffee filter⇒ For blocking ground coffee beans to pass through.  
Air filter⇒ For removing dust and dirt and letting clean air to pass through.

# Coil's Functions "Filtering"

**"Filtering" for the Sound means**  
Extracting some components of the sound.

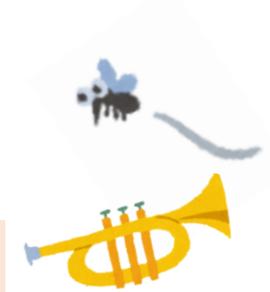


Break down one sound  
into three components using filters.



**The Sound  
at High Frequency**

Ex) The Mosquito noise, Trumpet



**The Sound  
at Mid Frequency**

Ex) Female Voice, Violin



**The Sound  
at Low Frequency**

Ex) Wood Bass



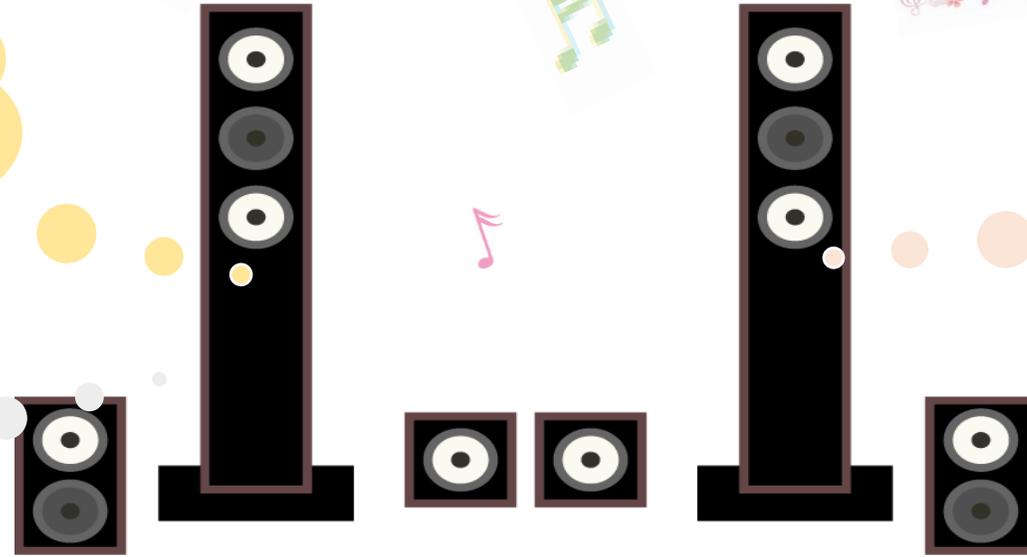
# Coil's Functions "Filtering"

It only passes the specified frequency.

**Band-pass filter(BPF)**  
It passes frequencies within a certain range and rejects frequencies outside that range.

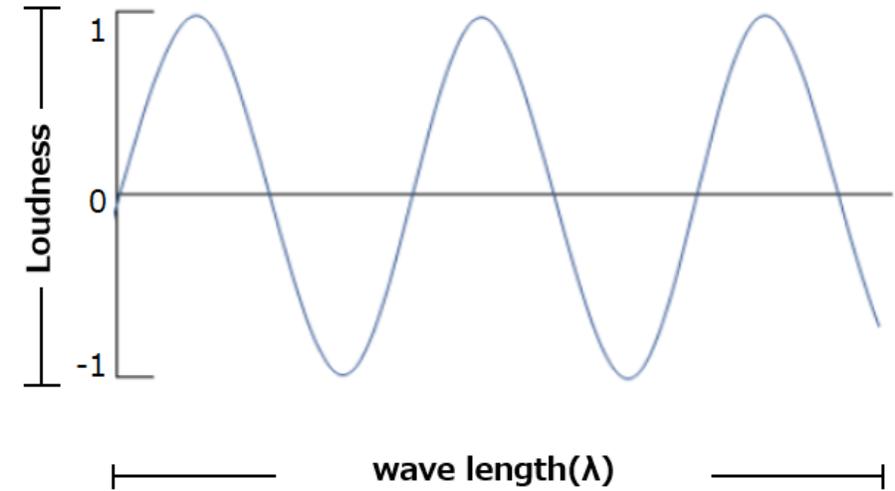
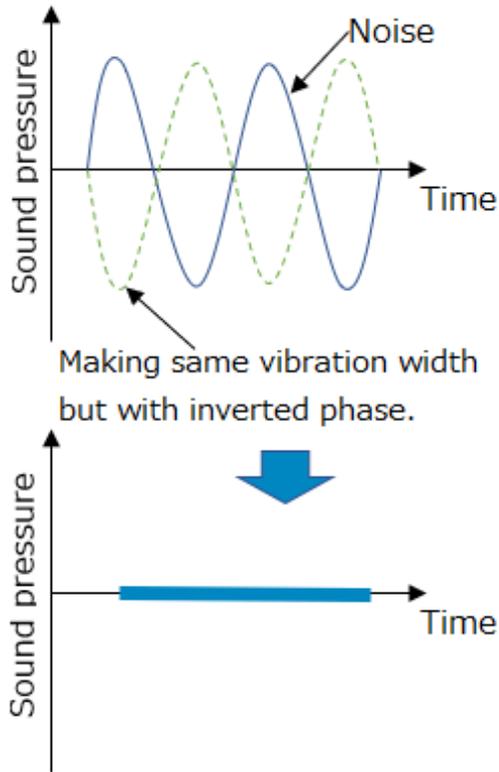
**Low-pass filter (LPF)**  
It passes frequencies within a low range than certain frequencies.

**High-pass filter (HPF)**  
It passes frequencies within a high range than certain frequencies.



# It's a side note from coil...

Sound is figured by a waveform on the right.



The sound can be canceled by overlapping an inverted waveform on the original waveform.  
(See left figure)

This principle is adopted for Noise canceling headphones.

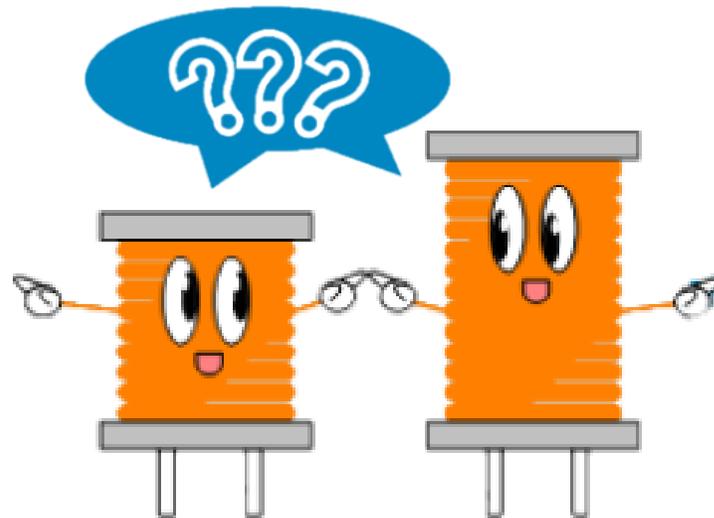


To be continued...



# Dear Rookie of the Coil

## Chapter 5 Coil's Functions 【Transmission & Reception of radio wave】



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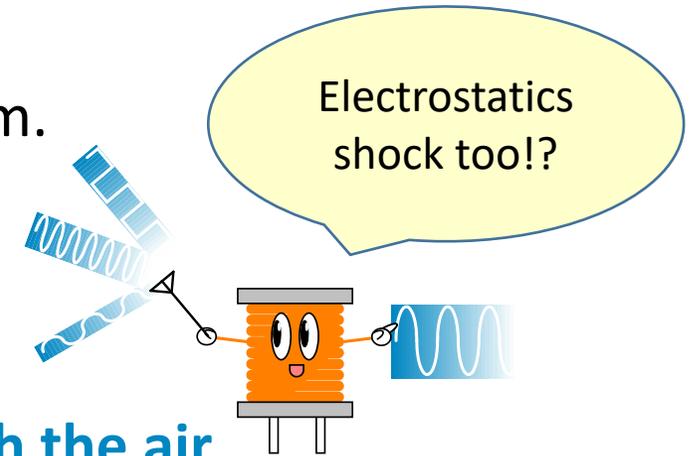
# Coil's Functions "Transmission & Reception of radio wave"

We will explain about one of functions  
"Transmission & Reception of radio wave" in this time.

Radio Waves are flying in the air  
even though we are not able to see them.

What is **Radio Waves** like ?

**Radio Waves are  
the Wave of Electrical Energy moving through the air.**



Radio, TV, Smartphone, Satellite etc...  
Coil contributes to the receiving of these types of radio waves.

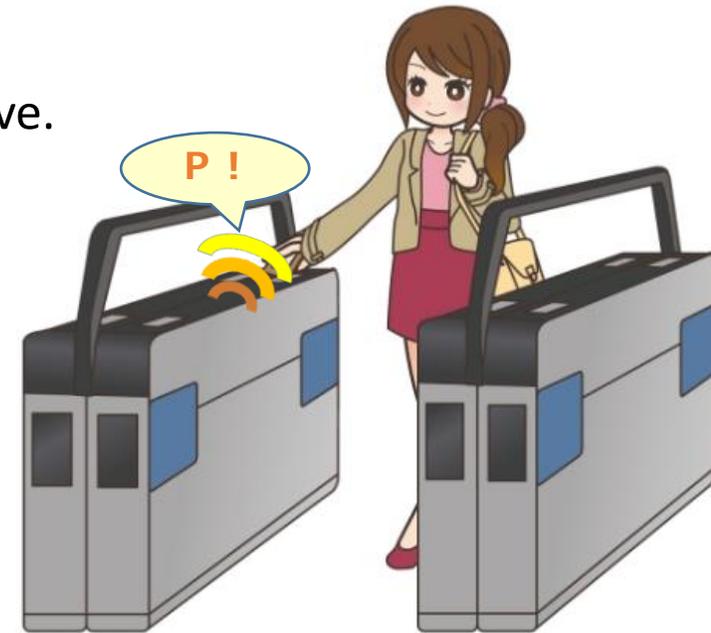
# Coil's Functions "Transmission & Reception of radio wave"

## Example of **Transmission and Reception of Radio Waves** by through coil Using IC Card at Automatic Ticket Gate

1. The radio waves are transmitted the Card reader in the Automatic Ticket Gate.
2. When you put the IC Card coil's built in closer to the Gate,  
that IC Card would receive the radio wave.
3. Electric Current is generated as Coil is put close to the radio wave.
4. That Current activates the IC chip of the IC Card.
5. The data communication is processed through the coil.

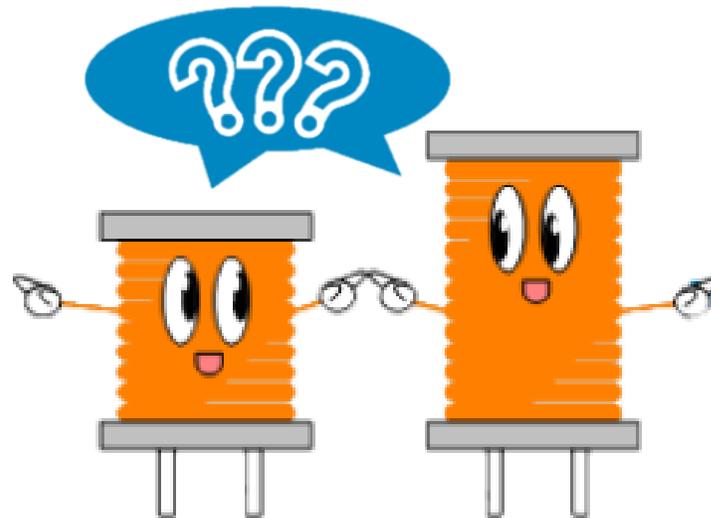


To be continued...



# Dear Rookie of the Coil

## Chapter 6 What are Coils used for?



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# What are Coils used for?

This is the last episode of “Dear Rookie of the Coil.”  
Let's look at below items we use in our daily life, which coils are used.



# What are Coils used for?

Have you ever had at least three items out of these five items?

Do you feel a little bit closer?

We think the Car is  
the biggest user of the Coils.

So Let's take a look at the car more.

We are inside of  
any products  
basically.



# What are Coils used at Car?



Electric Parking Brake



Airbag



Drive Recorder



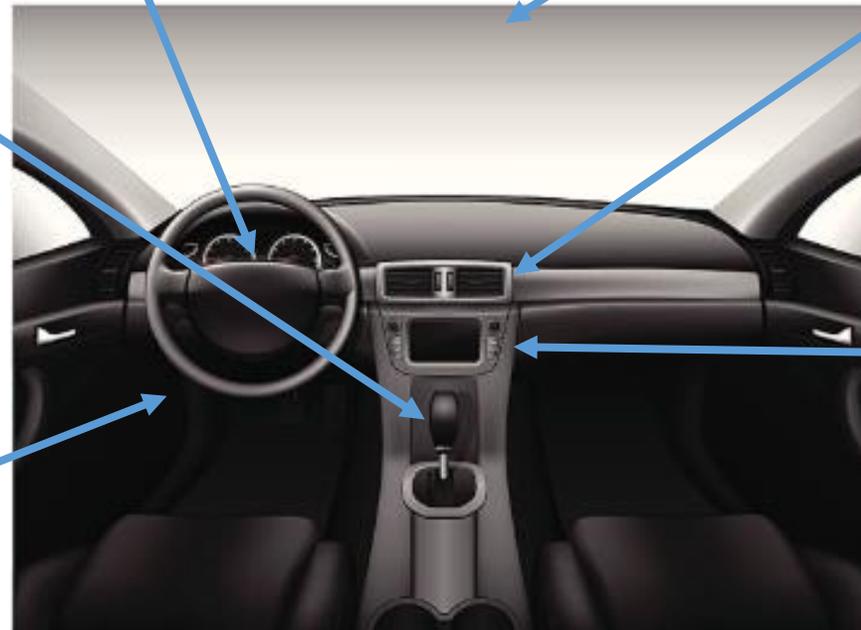
Car Air Conditioning System



Car Audio System  
GPS System

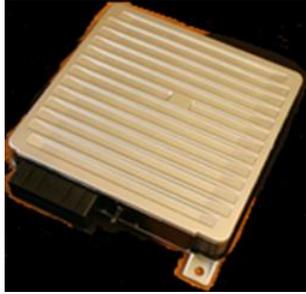


Electronic Toll Collection System



# What are Coils used at Car?

Engine Control Unit "ECU"



Shark Fin Antenna



Smart Key System



LED Headlight



Ultrasonic Car Sensor

# Coil is a Profound Product.

How was your study ?

The Coil is a simple thing just wound with an electric wire.

Though the Coil does not have the gorgeousness points such as Semiconductor, there are various functions, and “Profound Product” in any situation.



We have also posted “**Tips for COIL users**” on our website.

It explains more details. Please visit below URL

“<https://www.sagami-elec.co.jp/en/techinfo/techinfo.php>”

and hope you will find it useful.

Thank you for your attention.

